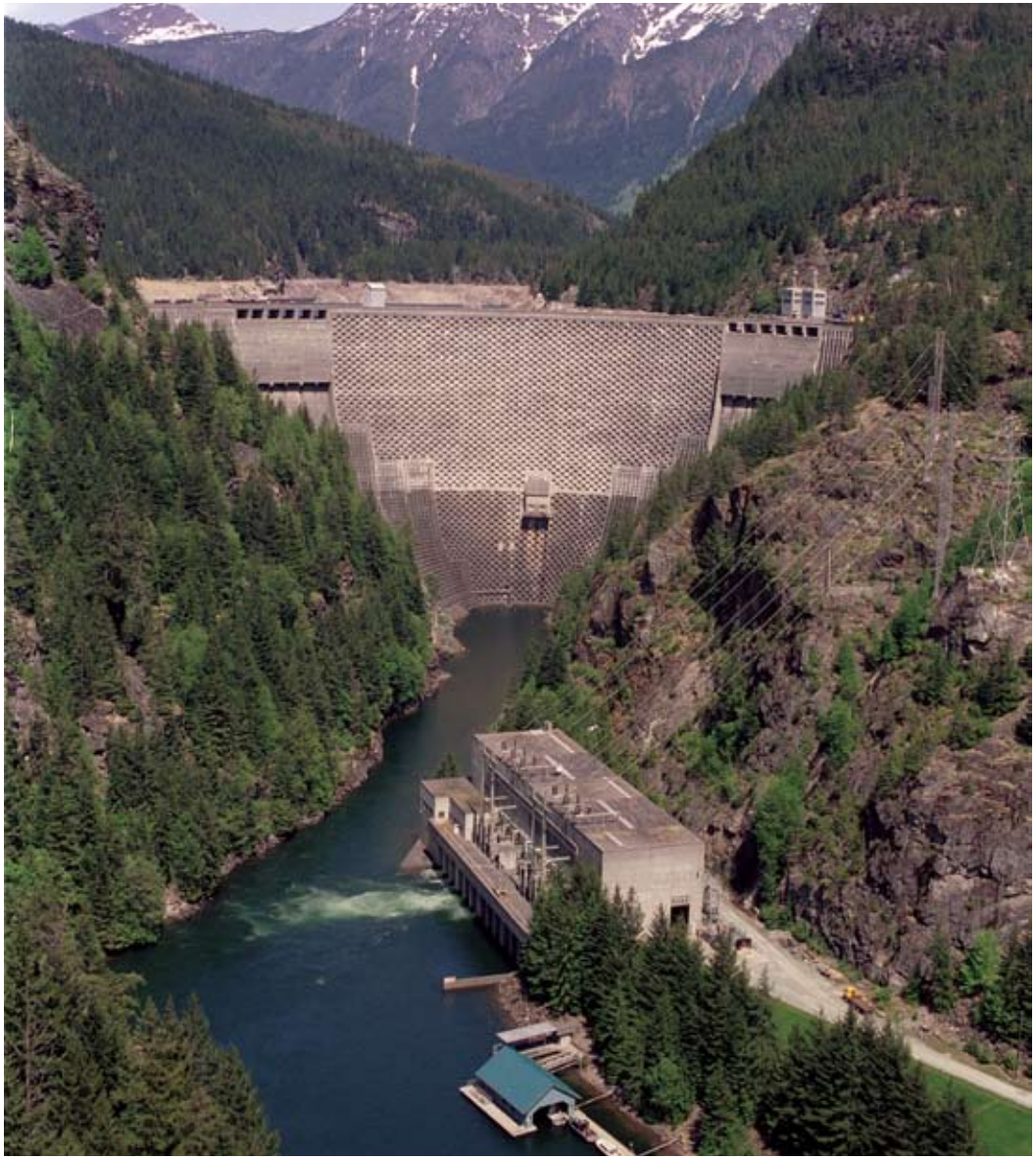
2010 Integrated Resource Plan – Executive Summary



Key Findings and Conclusions

- **City Light should continue on a path of acquiring conservation at an accelerated rate.**

  Conservation is the resource of choice and, as recommended in the 2008 IRP, should be acquired in the near term to gain the greatest benefit. Conservation is lower cost than renewable resources, and Washington State Initiative 937 (I-937) requires utilities to acquire cost-effective conservation. Because it reduces load, conservation reduces the amount of renewable resources and renewable energy credits (RECs) the utility must acquire to comply with I-937. It is also has lower risk than other resources.

- **The utility can potentially meet energy needs through 2020 without acquiring new generating resources.**

  Between now and 2020, the utility can, on an average annual basis, meet its firm resource needs with conservation, Gorge Tunnel 2, increased use of flexibility in existing hydro contracts, exchanges, and short-term wholesale market purchases. Nevertheless, the utility must acquire either renewable resources or renewable energy credits by 2016 for compliance with Initiative 937.

- **City Light should continue to acquire renewable resources and/or renewable energy credits (RECs), as necessary to meet I-937 requirements by 2016.**

  In 2016, the I-937 requirement for renewables and/or RECs jumps from 3% to 9% of annual load. The utility resource acquisition strategy calls for acquiring an average of about 7.3 average megawatts per year of renewable energy credits or renewable energy between now and 2016 in order to meet the requirement. The amounts of renewables and RECs purchased in any one year will depend on availability and cost.

- **A mix of renewable energy credits and renewable resources performs better in IRP analyses.**

  Significant uncertainty remains about the future costs of renewables, wholesale power prices, the cost of RECs, and the cost of CO_2 emissions. The IRP risk analysis and scenario results both indicated that in simulations, the portfolios most heavily-weighted toward either new resources or RECs did not perform as well as a mix. The recommended resource portfolio contains a mix of renewable resources and RECs.

Gorge Dam is one of three City Light dams in the North Cascades.

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Recommended Resource Strategy

Preferred Portfolio (Average Megawatts)										
Year	Conservation	Reshaping & Exchanges	Gorge Tunnel 2	Biomass	Priest Rapids Opt.	Geothermal	Wind	CHP/ DG	RECs	Total RECs & Resources
2010	14									14
2011	30	50								80
2012	46	70								116
2013	61	70								131
2014	74	70								144
2015	87	70	5							162
2016	100	70	5	14					17	206
2017	113	70	5	14	24				19	245
2018	124	70	5	14	24				22	259
2019	127	70	5	14	24	18			4	262
2020	130	70	5	28	24	18	56		9	340
2021	131	100	5	28	24	18	104			410
2022	132	100	5	28	24	18	104		11	422
2023	133	100	5	28	24	18	104	6	7	425
2024	134	100	5	28	24	18	104	6	9	428
2025	135	100	5	28	24	18	104	6	11	431
2026	136	100	5	28	24	18	104	6	13	434
2027	138	100	5	28	24	18	104	6	15	438
2028	139	100	5	28	24	18	104	6	17	441
2029	140	100	5	28	24	18	128	6		449

The recommended resource strategy is a continuation of the utility's policy of obtaining low-cost power with low environmental impacts for its ratepayers/owners while making the most of its existing resources. Conservation is the first choice resource. In order to comply with I-937 requirements in 2016, the utility plans to acquire gradually a combination of new renewable resources and renewable energy credits (RECs) in the intervening years, depending on cost and availability. After 2016 the utility plans to continue to acquire a combination of renewable resources and renewable energy credits sufficient to meet both I-937 and resource adequacy (the ability to serve customer's electrical demand and energy requirements at all times). Power will be purchased from the wholesale market when resource need exists and acquiring new resources is not justified. When needed, new resources will be acquired in the most cost-effective manner for our customers, taking into account the full cost of the resource and the total value of any associated renewable energy credits and power.

IRP Action Plan, 2010-2011

Actions	2010	2011
Conservation Resources		
Pursue accelerated conservation in the amounts targeted in the Hi-Cons. portfolio	14 aMW by end of 4th Qtr	16 aMW more by end of 4th Qtr
Complete a new conservation resource potential assessment for use in resource planning and I-937 compliance	Complete project design and contracting	Begin incorporating study results into IRP
Generation Resources		
Pursue full BPA contract rights	Analyze contract and provide input	Finalize the contract in 2011
Market Resources		
Serve retail load with market purchases, short-term exchanges, and transactions to reshape seasonal energy as needed	Ongoing	Ongoing
Other New Resources		
Continue to acquire RECS and/or renewable resources, in keeping with the resource acquisition strategy, in order to meet I-937 requirement for 2016	As budget allows	Acquire an annual average of 7.3 aMW of renewables and/or RECs
Monitor and investigate evolving technologies having potentially large impacts on electric service (e.g. electric vehicles, fuel cells, solar)	Ongoing	Ongoing
Transmission		
Work to ensure sufficient transmission transfer capability for City Light to support serving peak customer demand	Ongoing	Ongoing
Future IRPs		
Review long term resource adequacy planning standards and metrics for City Light and assess impacts to reliability	Analyze winter resource adequacy metrics and strategy	Implement any changes within the 2012 IRP
Continue participation in and evaluation of climate change research for impacts to hydro operations and fish populations, as budget allows	Focus research on Cascade glaciers and impacts to river temperatures as budget allows	Begin evaluating findings in 2012 IRP as budget allows
Evaluate prospects for renewable energy credits, including future availability and cost	Ongoing	Input new assumptions into 2012 IRP forecasts

Integrated Resource Planning Process

The Key Findings and Conclusions and the Recommended Resource Strategy described above are the result of a two-year planning process that began with the marshalling of internal and external expertise and culminated in City Light's preferred portfolio. The steps in this process are outlined below and followed by brief discussions of topics pertaining to the process and the plan.

- Recruiting expertise from within the utility to form the IRP Team.
- Convening a group of stakeholders with diverse perspectives.
- Forecasting customer demand for power each month through 2029.
- Developing costs and characteristics of alternative resources to be included in the candidate resource portfolios.
- Enhancing modeling capability to better reflect the characteristics of City Light's hydroelectric operations and purchase power contracts.
- Refining the resource adequacy measure, crucial for defining the timing and amount of future need.
- Utilizing a highly detailed computer model of the western electric system, the AURORAxmp(r) Electric Market Model, for evaluating resources, portfolios, and portfolio risk.
- Conducting meetings out in the community to garner public input on candidate resources and portfolios.
- Constructing and modeling candidate resource portfolios for evaluation against four criteria: reliability, cost, risk and environmental impacts.
- Advancing better-performing candidate resource portfolios for further analysis.
- Recommending a long-term resource strategy and near-term resource action plan.

The first two topics discussed below – Legislative and Policy Direction and Public Involvement – provide the context for the IRP planning effort. The third – Existing Resource Portfolio – presents the characteristics of current resources, which inform the selection of additional resources. Load Growth shows the expected load for the planning period, and Annual Load/Resource Balance explains that the existing resources are capable of meeting load on an annual basis. Winter Resource Availability expands on the issue of meeting winter load. Resource Choices describes currently available and future resources, and finally, Portfolio Analysis describes how the candidate portfolios were analyzed and how the preferred portfolio was selected.

Boundary Dam is located in Northeastern Washington on the Pend Oreille River.

The Recommended Resource Strategy is the result of a two-year planning process that began with the marshalling of internal and external expertise and culminated in City Light's preferred portfolio.

Legislative and Policy Direction

The IRP is developed within the bounds set by elected officials in Washington State House Bill 1010, passed in 2006. Legislation that most directly affects City Light's Integrated Resource Plan is Washington State Initiative 937, also passed in 2006. This legislation is consistent with Seattle City Council Resolution 30144 (2000), which directs the utility to meet load growth with conservation and renewable resources.

State Initiative 937 requires utilities with more than 25,000 customers to acquire cost-effective conservation and to acquire increasing percentages of renewable power and/or renewable energy credits. Initiative 937 has an impact on the both the timing and amount of conservation and renewable resources (or RECs) that the utility must acquire. City Light's recommended resource strategy complies with the City's interpretation of the initiative.

Public Involvement

As a municipal utility, City Light values and seeks input from the public. City Light solicited input from members of the public throughout the IRP planning process at both stakeholder meetings and public meetings for the broader community. The IRP stakeholder committee included residential, commercial and industrial customers, environmental organizations, power resource suppliers and energy-related government agencies. This committee guided resource planning efforts during a series of meetings with comments, questions and suggestions throughout the process. Members of the public also attended IRP meetings held throughout the community and offered their opinions on both resources and candidate portfolios.

Existing Resource Portfolio

City Light's own hydroelectric facilities are located mainly in Washington State. In 2002, City Light added wind power to its portfolio when it signed a 20-year contract to purchase output from the Stateline Wind Project in eastern Washington and Oregon. In 2007 City Light began purchasing power from a biomass plant owned by Sierra Pacific Industries in Burlington, Washington. In accordance with the 2008 IRP Action Plan, City Light now has a 20-year power purchase agreement with Waste Management Renewable Energy, to purchase approximately six average megawatts of output from the Columbia Ridge Landfill Gas project in Arlington, Oregon. The utility has also contracted with King County for output from a planned cogeneration plant at the West Point Treatment Plant in Discovery Park.

Two of City Light's existing renewable generating resources: Columbia Ridge Landfill Gas project in Arlington, Oregon, and Stateline Wind project in eastern Washington and Oregon

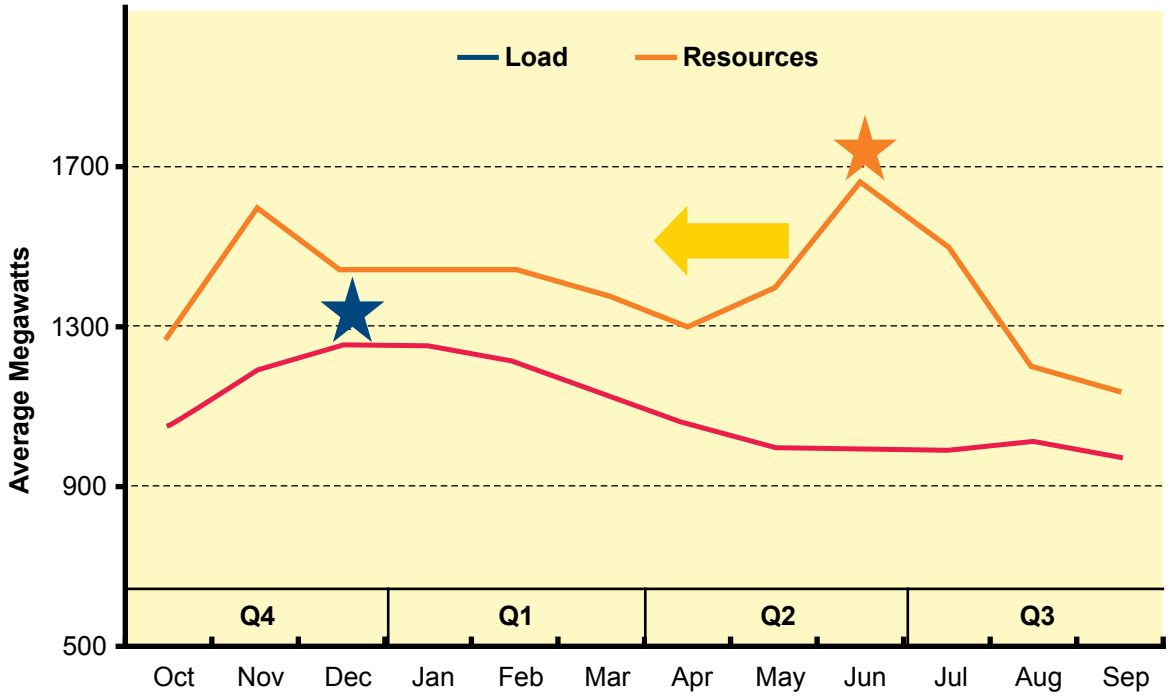
City Light's Generation Resources

Ross Dam and Diablo Dam are located in the North Cascades.

Decisions about the acquisition of new resources must take into account the utility's existing portfolio. The current portfolio includes conservation, generation resources and market resources. City Light policy makers have been committed to conservation as the resource of first choice for over 30 years. Generation resources include low cost City Light-owned hydroelectric projects, power purchased at preference rates from BPA, and contract purchases from other entities. The utility supplements these resources with purchases made in the wholesale power market.

Nearly 400,000 customers depend on City Light for electric power.

Load and Resources Are Out of Synch



Characteristics of the existing resource portfolio influence the choice of resource additions. The two dominant characteristics are hydro variability and monthly shape. The monthly shape of generation from the existing portfolio is not in synch with service area load. Load is highest in winter, but generation is highest in late spring. This suggests the use of strategies that reshape generation to meet winter load. Properly constructed summer for winter seasonal exchanges can accomplish this. Also, surplus energy from the 2nd quarter spring runoff can be sold ahead and the proceeds used to buy energy ahead for the 4th and 1st quarters, in effect reshaping the energy from the spring to the winter, as displayed above.

View point at Boundary Dam

Hydro variability refers to the very broad range of generation capability determined by precipitation and can be very challenging to manage. The graph to the right shows what would be generated by the Skagit Project, Boundary Dam and BPA Slice product under conditions of historic water and current river regulation. City Light must ensure that sufficient winter resources are available to provide the power needed by its customers under the combination of drought conditions (such as in 2001) and very low winter temperatures. At the same time, the utility must also make the effort not to acquire too much surplus power, in order to avoid the risk of not being able to sell surplus power at favorable prices.

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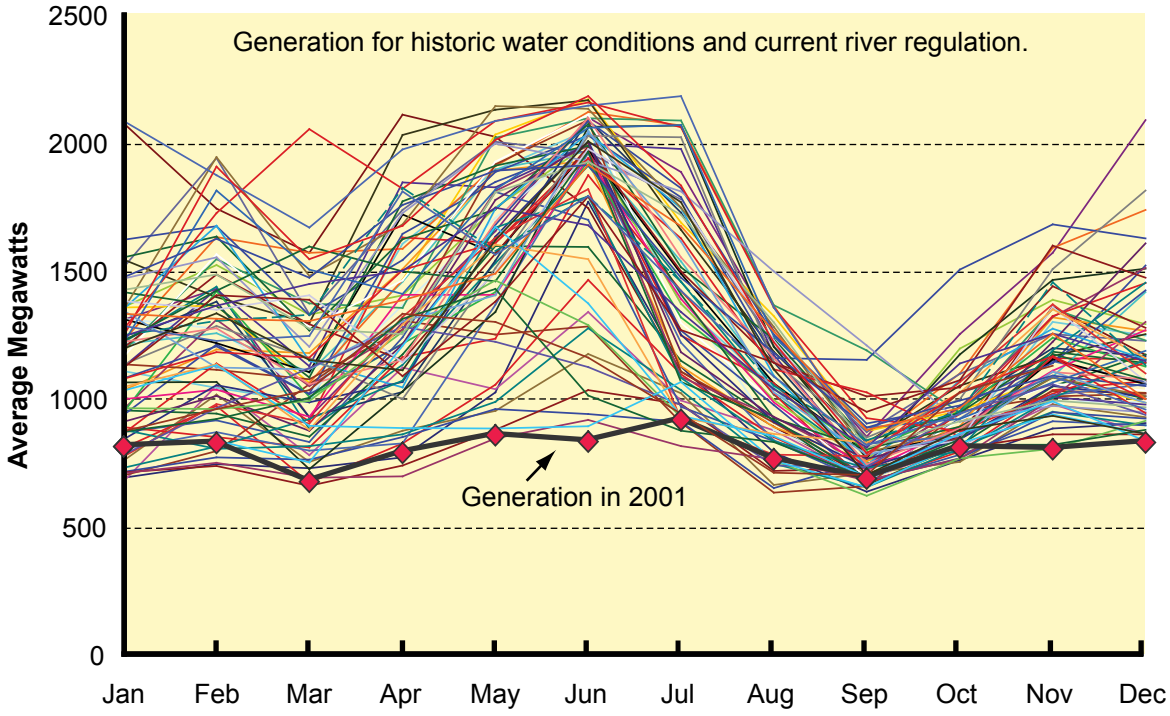
Skagit, Boundary and BPA Slice
(Monthly Generation, 1929 - 2003)

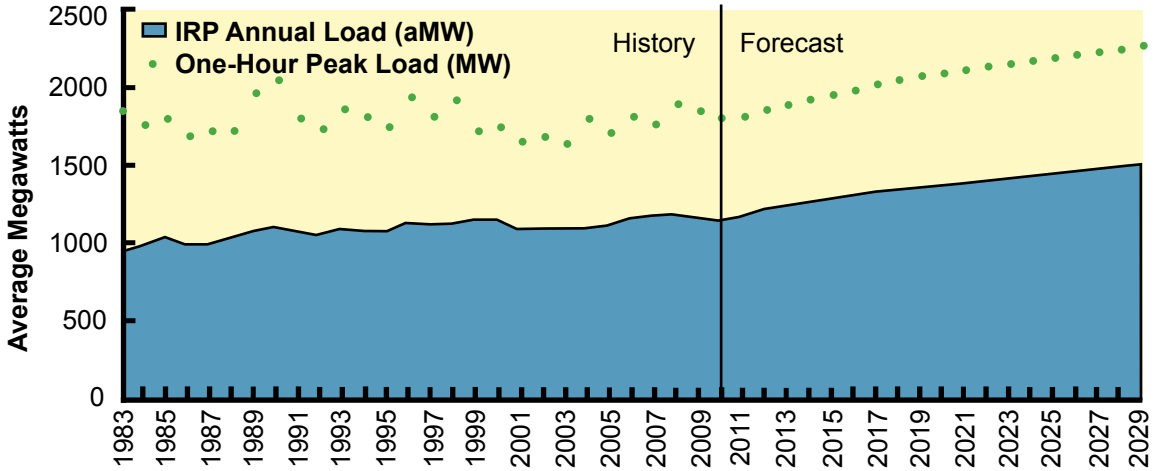


Load Growth

A first step in assessing the need for additional resources is a forecast of Seattle's future electricity demand. The utility's long-range forecast projects a slow recovery from the recession, followed by continued long-term load growth for the service area. Load growth is a function of economic activity, and, as the commercial center for the region, Seattle is well-positioned for strong economic growth when the current downturn ends.

The IRP treats conservation as a resource and evaluates it in the same way as it evaluates other resources. The graph to the right, therefore, shows the load forecast, assuming no new programmatic conservation.

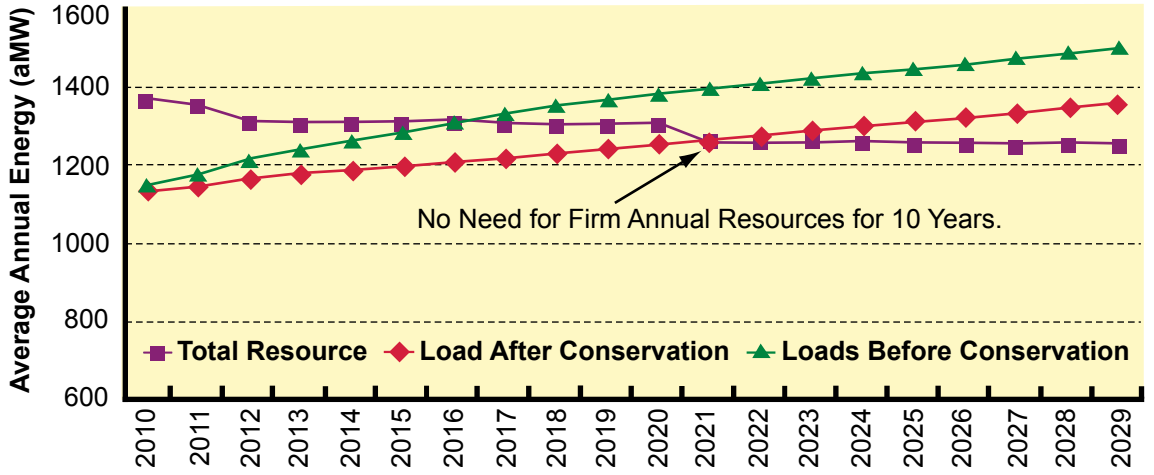
Annual Load History and Forecast
(with no new programmatic conservation)



Annual Load/Resource Balance

City Light provides a high level of resource reliability. On an average annual basis, City Light's current portfolio of firm resources can carry it through until about 2021. In an average water year and with normal temperatures, City Light often has substantial surplus power available to sell in the wholesale power market, even during the winter when load is highest. Under critical water and average demand, however, City Light could be short of firm resources on an average basis by 2021. The graph to the right shows annual energy from existing resources compared to load projections, with and without new programmatic conservation.

Existing Firm Annual Resources

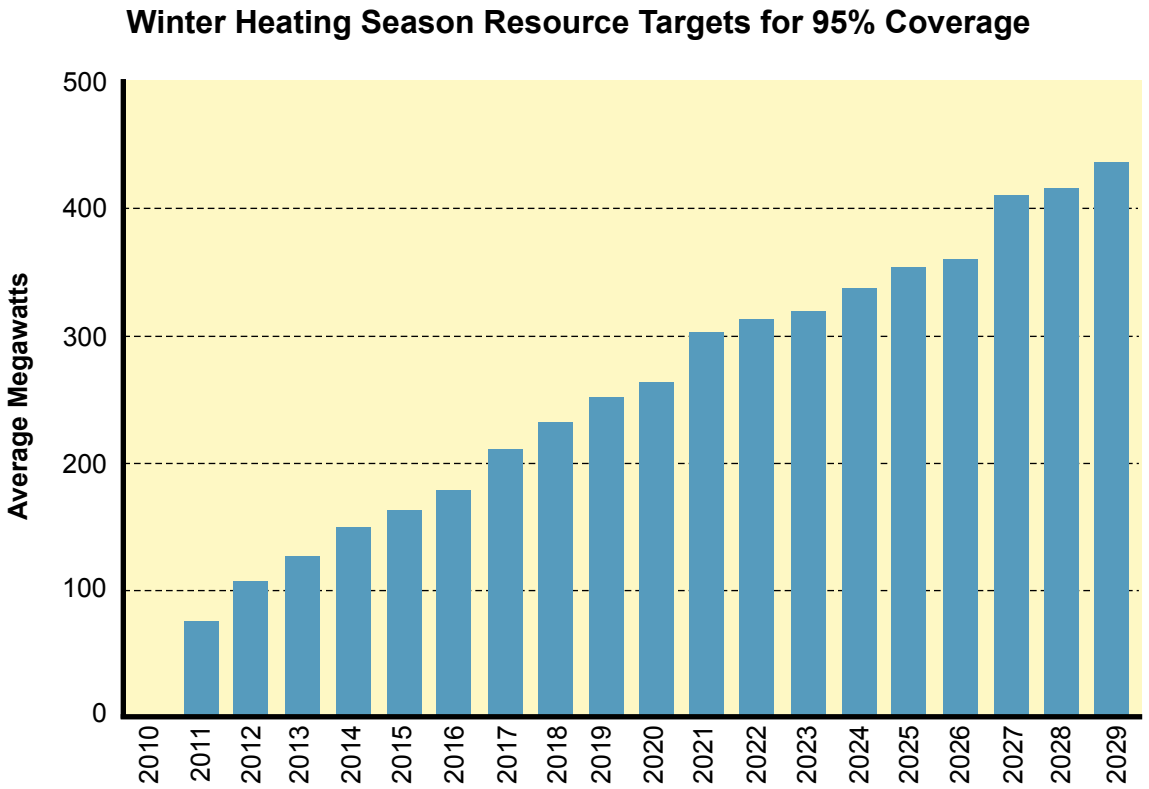


Winter Resource Availability

It is not enough to have sufficient resources on an annual average basis; City Light must serve load on a monthly, weekly and hourly basis. The greatest threat to City Light's resource reliability is the combination of very low water and very high customer demand for power. Low generation capability is usually due to drought conditions in the Pacific Northwest. High customer demand is usually due to extremely low temperatures in the winter. City Light's annual peak demand most often occurs in December or January, though historic lows have occurred as early as November and as late as March. City Light has hydro operational flexibility that can help to accommodate cold snaps lasting several days, even when water is low. Extended cold spells can deplete storage capability, creating operational challenges.

The 2010 IRP relies on a measure of winter resource availability that targets a 95 percent confidence level of meeting load in all hours in any given December. Using the 95 percent resource availability measure and assuming that 100 average megawatts of power can be purchased from the spot market even under extreme conditions, modeling the operation of City Light's existing resource portfolio shows that under very cold weather and low hydro conditions, the utility could need additional winter seasonal resources in 2011. The potential need for winter seasonal resources in 2011 increases through time as load grows and as existing contracts expires. By 2029 the potential need for power in the winter grows to nearly 450 average megawatts. The timing and amount of potential need for winter resources are shown below.

North Cascades snow pack



Resource Choices

The three main categories of resources are conservation, generation and the wholesale power market. Generation resources can be further categorized as renewable and nonrenewable.

Conservation City policy guidance and State Initiative 937 require the acquisition of cost-effective conservation. Certain conservation measures can improve load shape because their greatest effect is in the winter when the weather is colder and nights longer, requiring greater electricity use. Conservation also has the benefit of avoiding transmission costs. Conservation resource was the mainstay in both rounds of portfolio analysis, which examined both constant and accelerated paces of acquisition.

Market Near term purchases in the wholesale power market, as well as power exchanges, are used for supplementing own generation and long-term contracts, as needed in order to serve retail load.

Renewable Generation Renewable resources satisfy the need for power and avoid air and water pollution that endangers the environment and human health. Renewable resources could become even more advantageous with the eventual imposition of a carbon tax or a cap-and-trade scheme.

Initiative 937 mandates the development of such resources. The availability of transmission could be a problem. The cost of transmission for wind resources is especially high because transmission must be available even when the wind is not blowing. Besides wind, biomass is the renewable resource most likely to be available to City Light in the near term.

Non-Renewable Generation Non-renewable resources are generally fossil fuels such as coal, oil and natural gas. Their emission of greenhouse gases and air pollutants has significant impacts on the environment and human health, and the necessity of mitigation makes them costly. Natural gas resources can be sited close to load and would require little in the way of transmission upgrades, while resources remote to load, such as coal, would require significant transmission, further increasing their cost.

Most fossil fuel resources have an advantageous generation profile that allows them to meet utility customers' base energy requirements and frees up the hydroelectric resources to follow load. The only fossil fuel resource that can effectively follow load is the natural gas simple-cycle combustion turbine that can be used to meet peak load requirements or to operate during the hours proceeding the peak hour, thus saving hydro power to meet the peak requirements. Such a resource was examined in the first round of portfolio analysis.

Conservation resource was the mainstay in both rounds of portfolio analysis, which examined both constant and accelerated paces of acquisition.

Trail of the Cedars forest in the Skagit

Portfolio Analysis

The candidate portfolios were tested within the AURORAxmp® Electric Market Model developed by EPIS, Inc. City Light utilized forecasts of natural gas prices from Ventyx (formerly Global Energy Decisions) in its modeling. The Aurora model database contains installed capacity and customer load in the Pacific Northwest electricity market, which it uses to forecast electricity prices. The interplay of these four factors – natural gas prices, installed capacity, customer load, and electricity prices – defines the power market in which City Light is likely to be operating over the next 20 years.

The Aurora model simulated the operation of all candidate portfolios, based upon the operating characteristics of each resource and total portfolio cost, including fuel, operations and maintenance, transmission, and emissions. The amount of greenhouse gas emissions and air pollutants for each resource type was calculated, and costs were assigned to each category of emissions so they could be considered along with other portfolio costs. At any particular point in time, the least-cost resource was picked first, followed by the next least-cost resource, and so on, until load for that point in time was met. The portfolios were then evaluated using these four criteria:

- **Reliability.** All portfolios were designed to meet the 95 percent resource availability measure for winter.
- **Cost.** The net present value (NPV) of cash flows over 20 years for both capital and operating costs were calculated and compared.
- **Risk.** The sources of risk are uncertainty about hydro generation, level of demand, fuel prices and the market price of power for both sales and purchases. The portfolios varied in their exposure to these sources of uncertainty.
- **Environmental impact.** Carbon dioxide emission impacts were assigned costs, which were taken into account in the evaluation of each candidate resource portfolio. Total greenhouse gas and other air pollutant emissions over 20 years were calculated and compared for all portfolios. These included carbon dioxide, nitrogen oxides, sulfur dioxide, mercury and particulate matter.

The amount of greenhouse gas emissions and air pollutants for each resource type was calculated, and costs were assigned to each category of emissions so they could be considered along with other portfolio costs.

The table to the right compares the three Round 2 portfolios to a base case where only RECs are purchased to meet I-937 and power needs are purchased from the wholesale market, i.e., no new generation resources. All three perform well, but the Higher Conservation portfolio is the best. The similarity in performance of the Low RECs and High RECs portfolios is due to similar assumptions about the price of RECs in the future; the total amount of resources needed, and the timing of acquisition.

The Round 2 Portfolios were tested against scenarios that varied four assumptions: level of system load, cost of CO_2 emissions, price of natural gas, and price of RECs. The Higher Conservation portfolio ranked first in five of eight scenarios, essentially tying with Low RECs in two scenarios. Higher Conservation, shown to the right, is the preferred portfolio.

Round 2 Portfolios Difference From RECs-Only Case
Net Present Value (Millions) and Rankings

Portfolios in Round 2	Net Power Cost	NPC Rank	5% Chance of Higher NPV Cost	5% Chance Rank	Average Scenario Rank	Overall Rank
Higher Conservation	-$589	1	-$334	1	1	1
Low Renewable Energy Credits	-$470	2	-$294	3	2	2
High Renewable Energy Credits	-$424	3	-$301	2	3	3

Preferred Portfolio for Meeting Winter Resource and I-937 Needs